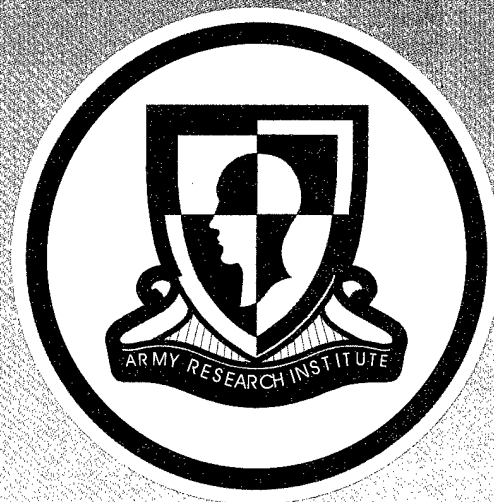


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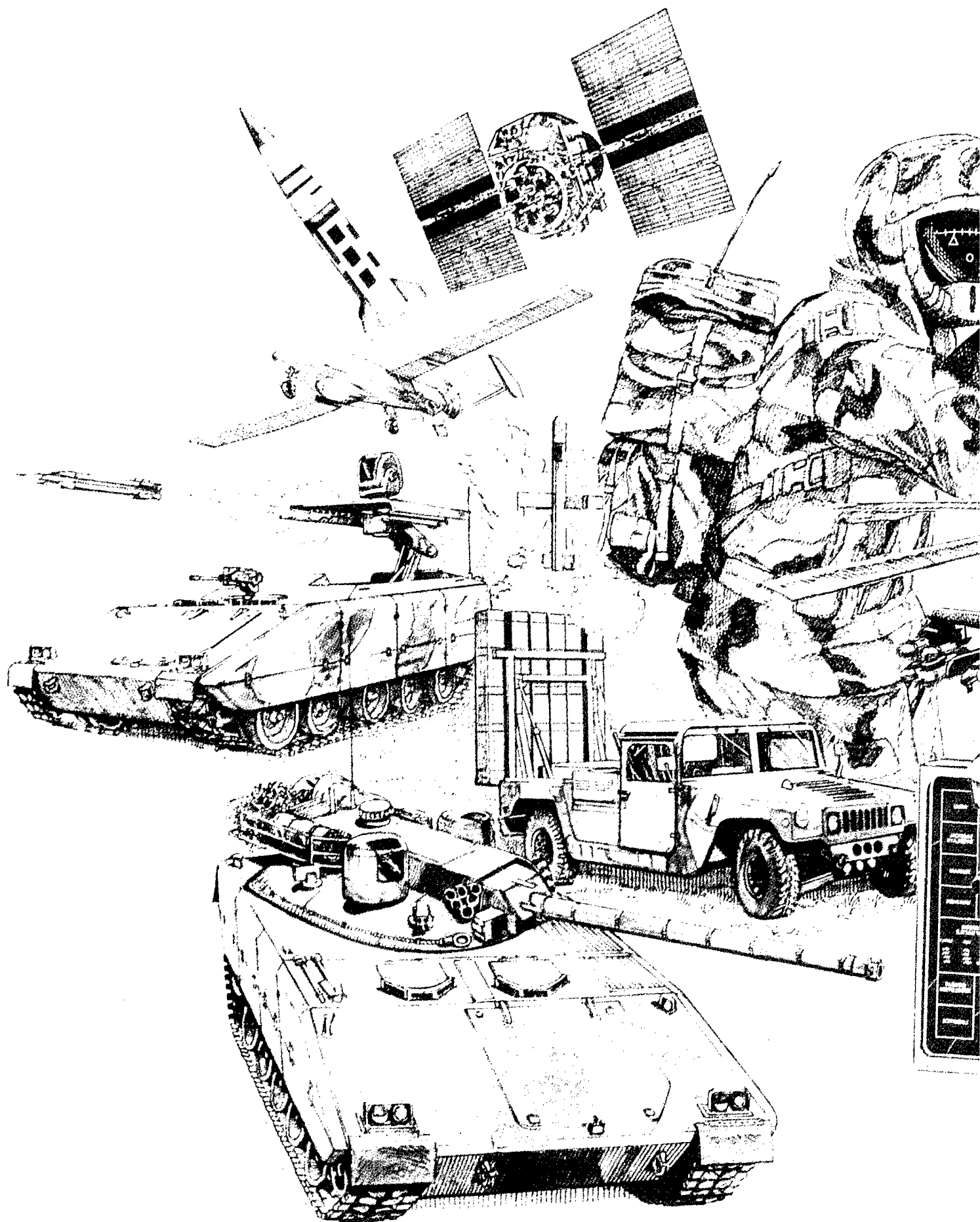


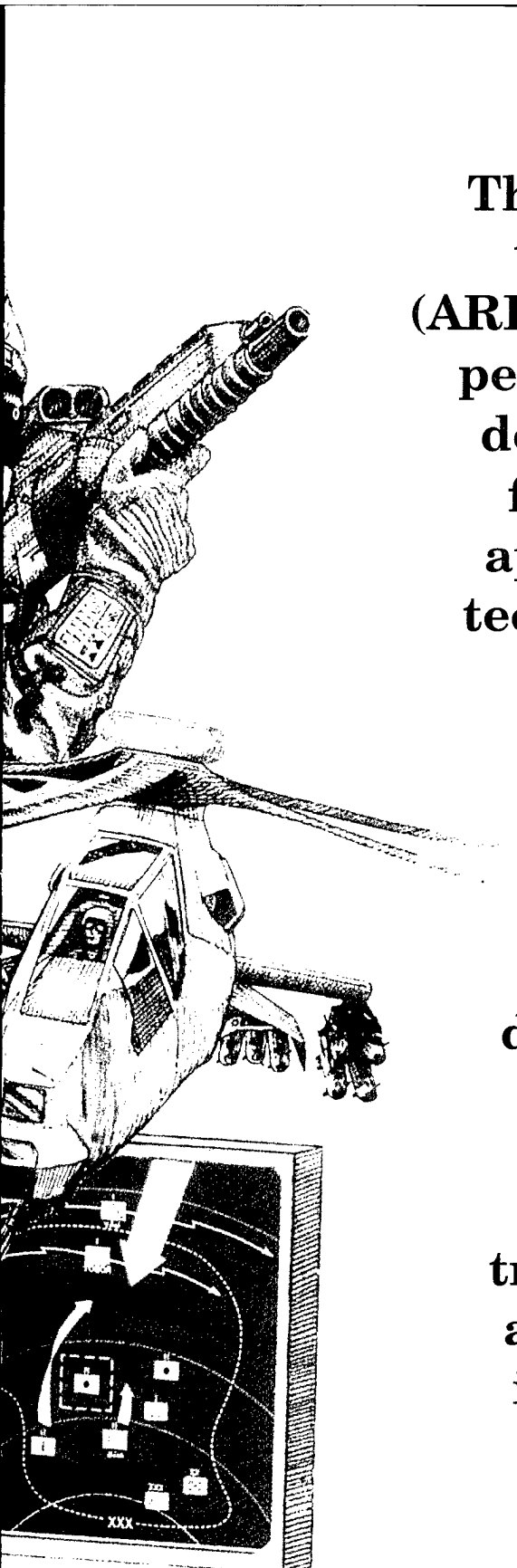
"Products Book"

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Recent Achievements in Soldier-Oriented
Research and Development

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A composite illustration on the left side of the page. At the top, a hand in a tactical glove holds a handgun. Below it, a helicopter is shown in flight. At the bottom, a tactical display screen shows a map with various icons and a large arrow pointing upwards.

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is the Army's primary manpower, personnel, and training research and development agency. This document focuses on recent products of ARI's applied research (6.2) and advanced technology development (6.3) efforts, and also includes some products from ARI's research-based studies and analysis (6.6) program.

ARI's research products are developed in response to expressed needs of sponsors and proponents, who are the initial beneficiaries of the work. However, technology transfer, technical advisory service, and other follow-up efforts are also important aspects of ARI's support for the Army, as is dissemination of information in documents such as this one.

The ARI Vision - To be:

- ★ **A preeminent laboratory in developing and fielding personnel performance and training technology.**
- ★ **A staff recognized as outstanding by peers in Defense laboratories, industry and academia.**
- ★ **An important asset close to Army users and recognized as essential to assuring the quality, trained manpower and units required for America's Army.**

ARI conducts behavioral and social science research in support of current and future Army MPT needs. Behavioral research is of vital importance to the Army in that it seeks to better understand, measure, predict, and change performance. And the bottom line for the Army is performance, be it in high-intensity conflict or in stability operations.

Much of ARI R&D leads to new methods for improving individual, unit, and leader performance, often through the cost-effective use of emerging simulation and training technologies. ARI research seeks to understand the underlying skills, knowledge, and experiences that are important for effective technical performance and planning, decision-making, and leadership. In addition, ARI researchers serve as objective, knowledgeable sources for senior Army decision-makers in the analysis and assessment of policies and programs.

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Quality Soldiers

The mainstay of the Army is its people. For the Army to maintain full readiness with a smaller force and reduced resources, it must ensure that people are assigned to jobs for which they are best qualified. They must also have support systems and career development opportunities that allow them to focus on their professional performance, both in peacetime and war.

ARI's Human Resources Development research is focused on leveraging available and emerging technologies, models, and tools to maximize the performance of the Army's personnel resources.

ARI's Selection and Classification research efforts are developing new technologies to help the Army successfully deal with a shrinking candidate pool with diminishing interest in Army service and an increasing demand for soldiers with advanced technical aptitudes.

Gender Integration of Basic Combat Training

**Products
Book**

ARI studied the attitudes of soldiers-in-training and training cadre during squad-level gender-integrated Basic Combat Training (BCT) for soldiers in Combat Support (CS) and Combat Service Support (CSS) military occupational specialties (MOS). Partially on the basis of the data collected in this study, the Army announced the policy to fully integrate BCT for CS and CSS MOSs in August, 1994.

In December, 1994 TRADOC established a Gender-Integrated Training (GIT) Steering Committee and asked ARI to collect data and assist in developing recommendations for improving BCT in a gender-integrated environment. This study focused on:

- ◆ soldiers' attitudes and evaluation of their BCT training experiences;
- ◆ drill sergeants' attitudes, an evaluation of the drill sergeant course, and their suggestions for improving BCT;
- ◆ attrition of soldiers during BCT;
- ◆ physical condition of soldiers at entry through graduation from BCT; and
- ◆ the training performance of soldiers.

TRADOC is reviewing the BCT Program of Instruction, the Drill Sergeant Course, and the Pre-Command Course to apply lessons learned from the study.



a1

Family Sourcebook

a2

ARI has recently published a review of "lessons learned" about family support operations in Army deployments during the past 15 years. The primary audience for the report, "How to support families during overseas deployments: A sourcebook for service providers," is individuals who operate family support programs at the installation level and below. The discussion of policy questions should also be of interest to higher level policy makers and program managers.

The report covers Army family support operations from 1980 to the present including The Multinational Force and Observers in the Sinai, Operation Just Cause in Panama, Operations Desert Shield and Desert Storm in Saudi Arabia, Operation Restore Hope in Somalia and Caminos Fuertes (Strong Roads) in Central America. The report provides "lessons learned" from these and other major deployments during this period.

The report also contains three appendices: (1) A list of family support resource materials (e.g., handbooks, pamphlets, program descriptions, and relevant Army regulations); (2) a discussion of how to handle families that do not cope well with deployments; and (3) a list of research reports that have been generated during this period.

Over 7,000 copies of the report have been distributed to family support agencies and interested parties in the Army, Navy, Air Force, and Marine Corps. It is currently being used by USAREUR to help guide family support operations during Operation Joint Endeavor in Bosnia. This report has also been loaded onto ARI's World Wide Web Home Page.

The Prototype Officer Personnel Inventory, Cost and Compensation (OPICC) Model

***Products
Book***

Information about the manpower costs and effects of personnel policy and other factors on the retention of active-duty commissioned officers is critical to the effective management of the officer force. Under the direction of the Deputy Chief of Staff for Personnel, ARI began development of an integrated model to capture the effects of compensation and labor market changes, as well as personnel management policies, upon officer retention, inventories and manpower costs. The resulting OPICC Model is a policy analysis software tool designed to improve the Army's ability to effectively and efficiently manage the officer force.

Model predictions have been successfully validated in several exercises by predicting historical behavior (from a prior baseline) in the OPMD officer force and then comparing the projected results to actual behavior. The prototype OPICC model (except for the cost module) is operational and PC-based with a user-friendly interface. It has been installed at the Office of the Deputy Chief of Staff for Personnel, Officer Division where plans call for utilization once continuation rates return to more stable patterns. Additionally, the Office of the Secretary of Defense, Program Analysis and Evaluation staff have expressed interest in the model and software, and are creating a generic four-service version.

a3

Montgomery G.I. Bill and Army College Fund Soldier Profiles

a4

The Montgomery G.I. Bill (MGIB) and the Army College Fund (ACF) are important enlistment incentives to induce high quality individuals to enlist in the Army. ARI examined differences in participation and usage behavior of individuals in these programs, tabulating results by gender, race, entering educational level, and marital status, for both program participants and benefits users. Descriptions are now available of who uses their benefits, when and where they are used, and how much is used. Regression analyses of the amount of benefit used for a sample of veterans who enlisted in FY86 tested whether there are differences in usage behavior by demographic factors, educational level at entry into the Army, and AFQT categories. The results of these analyses indicate that there are statistically significant differences in usage behavior by marital status, race, and AFQT category. This information is used by ODCSPER in developing budget estimates for the programs.



Attitudes and Perceptions of Junior Army Officers (LROC Survey)

***Products
Book***

The Longitudinal Research on Officer Careers (LROC) survey was administered by mail to about 10,000 junior officers during the years 1988, 1989, 1990 and 1992. Surveying officers' attitudes and perceptions over time will result in a prime vehicle for better understanding the impact of policy and external influences on the career intentions and decision-making processes of Army officers.

a5

Survey items found to be useful as composites or scales included:

- ♦ satisfaction with supervision, with peers, with promotions, and with work;
- ♦ tolerance of military demands;
- ♦ civilian vs. Army standard of living;
- ♦ civilian market ease of entry;
- ♦ characteristics of the job;
- ♦ organizational identification; and
- ♦ retention propensity.

The evaluation of the survey design, administration and data management, together with recommendations on how to adjust all of these for an operational environment, is supporting the survey's becoming operational under the Army Personnel Survey Office in FY96.

The Army Alumni Survey

Under sponsorship of the Recruiting Command, ARI sent surveys to 9000 Army veterans who had successfully completed one term of service and left the military between 1982 and 1989. The survey inquired into reasons for enlisting, experience during service, reasons for departing, and experiences since separation. Principal findings are:

a6

◆ 56% said they were successful in their post-service careers,

◆ 60% of those who said they were very successful gave substantial credit to their Army experience,

◆ 56% took advantage of education benefits after leaving the Army,

◆ 90% rated their Army experiences as valuable,

◆ 85% said that they would enlist again if they had it to do over.

These findings provide valuable insights into how transition from military to civilian life is best made and what assistance may be needed to help those faced with this prospect in the future.



Army Career Transitions Survey (ACTS)

**Products
Book**

The purposes of the ACTS are to:

- ◆ Provide retention planners with important information about the major reasons that made soldiers think about leaving the Army, and to provide a way to monitor trends in these attitudes;
- ◆ Provide recruiting and marketing planners with an ongoing indicator of the advice Army veterans are giving the youth recruiting market; and
- ◆ Provide timely policy information through the use of special supplements that focus on topics of particular importance to the Army.

The survey instrument and administration procedures have been revised to provide additional policy-relevant information and to provide more standardized administration procedures. Both the Leadership Supplement and the satisfaction items which comprise the core of ACTS have been revised and tested. ARI analyzed the test results and developed recommendations for standardized administration procedures. At the completion of the project, ACTS was transitioned to the U. S. Army Personnel Survey Office for implementation Army-wide.

a7

Cohesion Research using Meta-analysis

ARI has applied the complex techniques of meta-analysis to the literature on cohesion in military groups. This meta-analysis is the first based on military groups only, and is also the first to investigate whether group cohesion affects performance more than performance affects cohesion. Some of the conclusions of this research are:

a8

♦ Cohesion is positively associated with various desirable military outcomes. This appears to hold across various types of U.S. military units and those in other countries.

♦ A variety of cohesion and outcome measures seem to lead to similar results. Performance effects on cohesion appear to be stronger than cohesion effects on performance. In other words, winning builds stronger, more cohesive teams.

♦ Our results based on military groups generally support the conclusions of previous meta-analyses conducted with data from a variety of groups, including sports teams and industrial work groups.

♦ The findings have clear implications for the Army to enhance cohesion through its personnel policies and training procedures.

Army Job Assistance Program Evaluation

***Products
Book***

ARI's evaluation of this program dealt with issues such as transition and job search assistance received, post separation employment, civilian job satisfaction, and attitudes toward the military. Findings indicate that the more job search assistance services received and the more satisfied users were with the services, the more they felt prepared and succeeded in the civilian job market, and expressed positive regard for the military. The Army can use these findings to guide job assistance efforts and the Recruiting Command can use them to demonstrate the extent of the Army's concern and support for soldiers' lifetime careers.

a9



ARI

Human Resource Development

Products
Book

Total Army Personnel Life Cycle Model (TAPLIM)

The TAPLIM is a manpower policy analysis tool that was initially built in the ODCSPER(PA&E) to support the Army's force reduction and to study the impact of key personnel management policies on the Army's enlisted force.

a10

However, with the closing of the ODCSPER Plans, Analysis and Evaluation office, the future of TAPLIM and its utility to the Army became uncertain. ARI took the initiative and obtained a copy of TAPLIM and successfully translated it from the LINDO code into the General Algebraic Modeling System (GAMS). This vastly improved the efficiency, tractability, and transportability of the model, and hence its usability by Army policy analysts for strength management planning. ARI is currently working with DMPM staff on improvements to the model and its application to current policy issues.



Special Forces

***Products
Book***

ARI's Special Forces research has produced, over the last 6 years, a large number of high-quality and useful products which have been well received by the U.S. Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS). This work culminated in the Special Forces technology demonstration held at Ft. Bragg, NC in September of 1996. The following is a sample of recent programs and research activities in this area.

(1) Manpower Planning. In June of 1995, ARI was invited to participate in a two-day Special Forces manpower planning workshop. ARI's analyses provided the basis for the manpower model developed during the conference and highlighted the impact that demographic changes in the recruiting or candidate population would have on the production of SF soldiers.

(2) Assessing SF Candidates. At the request of the commander of the battalion charged with assessing and training SF soldiers, ARI conducted research on the most effective ways to utilize peer evaluations in the Special Forces Assessment and Selection (SFAS) program. Our work led to the development and implementation of new peer evaluation forms and procedures. The new system provides the selection board with more comprehensive and reliable information on critical, but difficult to assess, individual attributes.

(3) Intercultural Communication. Critical performance dimensions relevant to intercultural communication for Special Forces (SF) have been identified, along with appropriate intercultural training topics. USAJFKSWCS training developers and planners may use the findings to improve the training SF soldiers receive for intercultural communication skill development. The findings include specific suggestions for training enhancements.

a11

Enlistment Decision Model

ARI has developed a model as part of research to understand the military enlistment decision-making process of young people. Model development was based on computer-assisted telephone interviews with a nationally representative sample of young men and their parents, and analysis of enlistment records.

a12

The model indicates that young men's views of their parents' receptiveness is the most important single influence in their enlistment decision making. This means that advertising messages pointed toward parents, and other messages showing young people talking with parents, are potentially very powerful influencers.

It also means, to recruiters, that making and maintaining contact with parents is very important, and it becomes more and more important the closer the prospect is getting to the decision time and the actual entry date.

Other findings include:

- ◆ A stated favorable attitude toward the Army, primarily as a means for personal self development, is an important predictor of enlistment intentions and actions.
- ◆ Young men's impressions that their friends are enlisting is another important motivator.
- ◆ How young people think their friends would view their enlistment is important.
- ◆ The youth market is a dual market consisting of college bound individuals and "work bound" individuals. Those who see themselves as college bound are in general not as good prospects to enlist as the other portion of the market, the "work bound" young men, who are more likely to consider enlisting and should be approached.
- ◆ Recruiters would do well not to disqualify from further consideration those prospects who express no interest, since the model's results indicate the paradox that most young men who enlist had previously stated that they had no interest in doing so. This transition from negative propensity to positive enlistment behavior may be the way parental influence affects the enlistment decision process. If so, it reiterates the importance of advertising to parents and recruiter contacts with parents.

Army Sample Survey of Military Personnel (SSMP)

***Products
Book***

The SSMP is an Army-wide survey that has been conducted regularly on an Army-wide basis since 1943, first as the Personnel Survey of the Army and since 1958 as the SSMP. SSMP data are used by Army policymakers to develop plans, assess policies, and evaluate program operations and outcomes. The survey experts who conduct the SSMP are maintained as Army staff members, ready to assist other Army agencies in conducting surveys.

ARI's Army Personnel Survey Office conducts the SSMP semi-annually in the spring and fall. Army-wide samples of 10 percent of officers and 2-3 percent of enlisted personnel who are permanent party and available for duty are selected. The sample sizes facilitate in-depth analysis on specific aspects of the topics being studied.

The SSMP is an omnibus survey designed to address in one questionnaire as many as 10-20 issues important to the Army, soldiers, and their dependent family members. Generally, sets of questions to track trends in behaviors, attitudes, etc. are included in the SSMP on a biennial basis. A standard set of demographic items is also included in each SSMP to facilitate in-depth analysis and tracking of changes in Army personnel characteristics.

The SSMP is an efficient survey research tool for the Army. The number of Army-wide surveys is reduced, and soldiers spend less time responding to surveys because fewer surveys are completed, sponsors are allowed to have only a few questions included in the SSMP, and demographic information questions are answered only once. Other advantages are that resources for survey distribution, administration, and analysis are used efficiently and effectively, and requirements for contract funds are reduced because there is an in-house capability to plan and conduct the survey, analyze the data, and prepare brief summary reports.

a13

Multinational Force and Observers (MFO) in the Sinai

In 1993, the Chief of Staff directed the Army to test the feasibility of recruiting qualified RC volunteers, forming them into a battalion-sized unit and deploying them for a six month peacekeeping assignment in the Sinai near the Egyptian-Israeli border. ARI conducted a comprehensive assessment of: the volunteer recruiting/screening process, predeployment training, the building of unit cohesion, soldier morale, and the effectiveness of the family support system. In addition, ARI researchers studied prior AC rotations to acquire a baseline on training, unit cohesion and morale of a typical MFO rotation. The primary questions were:

◆ Will Qualified RC Soldiers Volunteer? All of the required RC slots were filled with soldiers meeting the physical and performance standards set by Forces Command. Most soldiers said they volunteered for a challenging and adventurous way to serve their country and/or to enhance their military careers.

◆ Can a Cohesive, Trained, AC/RC Unit be Built? Since this battalion was specially formed for this mission, there was not previously established unit cohesion; therefore, unlike other MFO rotations, the leadership attended a four-week Infantry Leaders Course at Ft. Benning. Following this course, the leadership trained the newly arrived squad members on MFO tasks; this predeployment training culminated in an externally evaluated field exercise which certified the battalion as prepared to deploy to the Sinai.

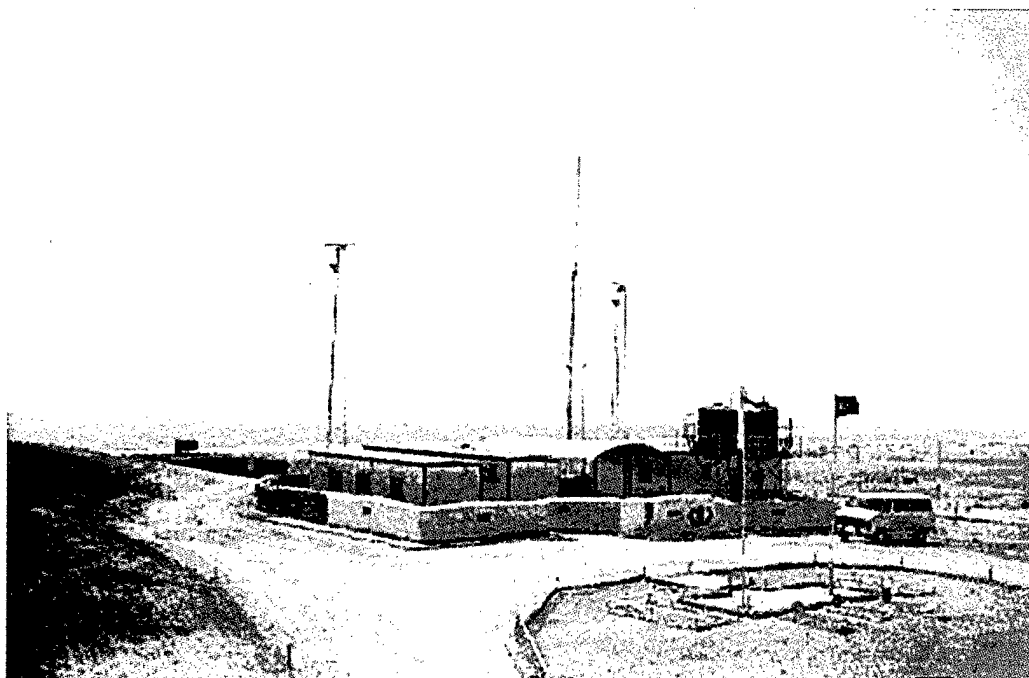
The battalion showed a level and stability of squad cohesion comparable to the previous AC rotation. Similarly, the results of the job knowledge test showed that soldiers from the AC/RC test unit scored the same as the AC soldiers from the previous rotation. This demonstrated that a cohesive, well-trained unit can be built from a mix of AC and RC soldiers who had not previously served together in the unit.

◆ Can the Army Support Geographically Distributed Families? Even though only 30% of RC soldiers were married, these families were scattered across 31 states. The solution implemented by the test battalion was a combined AC and RC system that energized existing assets to

support the MFO volunteer families. In addition, the battalion commander made family support a high priority and assigned a full-time NCO in the rear detachment to execute the family support system. Interviews and survey responses from RC spouses showed that they used family and non-Army friends as their primary means of support and problem solving, but those spouses who did use the Army's family support system found their problems satisfactorily resolved. They were generally supportive of their spouse volunteering, even after six months into the mission, many hoping this volunteer tour would increase their spouse's chances of joining the regular Army.

The ARI research has shown that the experimental test to combine RC volunteers with AC soldiers to form a special unit for the Sinai peace-keeping mission worked. There were a number of lessons learned, resulting in recommendations for improving the recruiting process, predeployment training and family support. The next research step is to track the RC volunteers to assess the long-term impact of their MFO experience on their military careers, civilian employment, finances, families, and quality of life as well as their willingness to volunteer in the future for MFO or other military assignments. The next step the Army is undertaking is a plan for incorporating the lessons learned from this test for the January 1998 Sinai mission, as well as for future use of RC volunteers to meet other world-wide commitments such as in Macedonia.

a14



Sleep Activity Patterns During Continuous Operations

Stability operations are generally of long duration and can undergo a number of shifts in direction over time. The stresses inherent in such operations will severely challenge the recuperative capabilities of individuals. The key to sustaining performance with limited combat personnel available for future stability operations is effective sleep management strategies. ARI tracked the sleep-work patterns of members of an OPFOR battalion staff during a low-intensity conflict scenario at the Joint Readiness Training Center. We focused on identifying staff members' sleep habits, both during and off rotation; identifying performance and mood changes during the course of the rotation; and evaluating the effectiveness of staff members' current sleep schedules in sustaining performance. Data were gathered on sleep patterns of battalion staff members, including total sleep time and sleep quality, battalion staff sleep requirements, and OPFOR work load levels.

The most notable finding on changes in performance on a computerized synthetic work task was individual differences in responding across time. While staff members' overall mean performance was satisfactory in absolute terms, some individuals' performance became increasingly variable over time, suggesting an unevenness in responding. This finding is significant since, in an operational setting, predictability of individual performance is crucial. Commanders need to know who is at risk, when, and for how long. Mood data indicated that the functioning of the group as a whole was slowing down somewhat over time. However, variability in ratings increased over phases, suggesting the importance of individual differences in responding to the effects of partial sleep loss.

This research shows that OPFOR battalion staff members did not receive the requisite amount of sleep necessary to function at optimal effectiveness during rotation. They obtained almost three hours less sleep per day, on the average, than they indicated they needed for full recovery. Off-rotation sleep, while longer in duration, averaged almost 90 minutes less per day than stated requirements. Optimal sleep requirements for battalion staff members were consistent with the sleep needs for the majority of the general population.

With regard to sleep quality, the continuity of sleep was frequently broken, though broken for only minutes at a time. However, an individual does not have to be actually awakened to dilute the recuperative effects of sleep.

This research, together, with observations from the combat training centers (CTCs) suggests that to effectively sustain staff performance during continuous operations the following points should be considered:

- ◆ Ensure that everyone understands why sleep is important and how lack of sleep affects certain types of performance;
- ◆ Effective sleep management starts with command emphasis; leaders must set the example for their units;
- ◆ The development of sleep-work plans should reflect, if possible, an awareness of individual sleep habits and shift work preferences;
- ◆ Delegation of appropriate duties and responsibilities to key staff members, liaison officers, and other Tactical Operations Center (TOC) personnel is crucial;
- ◆ More efficient means of managing information in the TOC, particularly during up-tempo operations, are needed.

a15



Special Forces (SF) Selection Assessment Research

***Products
Book***

A recent ARI research effort dealt with using aptitude, biodata and temperament measures to predict SF performance. The requirement was to: (1) determine the dimensions of successful performance in SF and the attributes needed for successful performance; (2) determine the value of using ARI temperament and/or biodata measures to predict performance and training attrition in SF; and (3) develop rating forms suitable for use in SF performance appraisal. ARI developed questionnaires measuring personal attributes and experiences identified in the job analysis, and developed measures of both SF-wide and MOS-specific performance. An adapted version of these measures is currently being used during SF Qualification Course training. The new performance measures can be used for training needs assessment and refinement, and to accurately measure field performance and troop readiness. The new predictor measures can be used to select higher quality applicants and reduce both SF attrition and training attrition.

b1



ARI***Selection and Classification******Products
Book***

Army Prototype PC-based Enlisted Personnel Allocation System (PC-EPAS)

b2

PC-EPAS is designed to demonstrate the productivity gains and attrition reduction that ensue from optimizing the assignments of new recruits to jobs. It works in two modes, planning and simulation, with a design that can serve as the core of a production version. In planning mode the model provides analysis capability to Army managers by establishing the feasibility of new policy options, supply environments, and training restrictions. In simulation mode the model provides detailed analysis of impacts by simulating individual applicant flow and job assignment. As a research tool, EPAS will also be particularly useful in the examination of the effects of alternative selection and classification techniques under development by ARI psychologists.



Self Assessment Computer-Analyzed Testing (SACAT)

***Products
Book***

An ARI-sponsored research product called SACAT requires the student to indicate confidence in the choice selected on a multiple-choice test. This one extra step makes a significant difference in what is communicated to the instructor as well as to the student. The ARI European Science Coordination Office (ARIESCO) is assisting in a validation with military students in a trade training/trade school setting to assess the military benefits and costs associated with the method. From a research standpoint, the method will be examined to determine its potential for improving retention and cultural fairness.

b3



Assessment of Individual Motivation (AIM)

b4

AIM is a new assessment measure that can be used to reduce the attrition of new recruits and improve duty performance. It's a self-report paper-and-pencil test that requires 30 minutes to administer, and it reliably measures examinees' dependability, adjustment, dominance, achievement orientation, agreeableness, and self-reported physical condition. Scores in these areas are predictive of first-term attrition and the performance of enlisted personnel in training and later on the job. A version of AIM is also being used to assess leadership potential of Army Rangers.

What is new about AIM is that it measures these motives in a way that makes it very difficult to "fake good" or coach examinees on how to score high on the test. The most recent version of AIM was administered to 1,000 recruits at Fort Jackson in June 95. Respondents from this data collection are being tracked to obtain their attrition status so that relationships between AIM and attrition can be determined.

AIM shows promise for improving the Army's capability to select applicants who are more likely to complete their obligated term of enlistment. Results from earlier samples show that AIM is predictive of early attrition and soldiers' commitment to serve. AIM shows little overlap with the ASVAB or previous education, which now serve as a basis for screening applicants. If these relationships between AIM and attrition hold up, AIM could be used to select among high attrition-risk applicants in all educational tiers.

Predicting Land Navigation Performance

***Products
Book***

There is a strong emphasis on land navigation and related skills in SF training. Following classroom and hands-on instruction, students must pass a final land navigation field examination. Given the cognitive demands of the land navigation task, we expected that students' performance on the field exam would be related to the ability to excel in what is known as "Spatial Visualization-Rotation," as measured by the Assembling Objects (AO) test, a product of the Army's Project A. Research conducted at ARI has shown that the AO test is an excellent measure of both spatial aptitude and more general problem solving skills. A number of our analyses have demonstrated AO's superior performance in adding value to the ASVAB for predicting success across a wide range of criteria and Military Occupational Specialties. We looked at the relationship between AO scores and performance on the land navigation field exam. Higher AO scores were associated with higher first time pass rates as well as lower rates of multiple failures. Candidates for SF training now take the AO test, along with other measures, at the beginning of the Special Forces Assessment and Selection (SFAS) program. During the training phase, extra instruction may be given to candidates with low AO scores. Later, during the first SFAS evaluation phase, scores are provided to members of the selection board that meets to determine whether or not marginal candidates will be allowed to continue in the program.

In addition to these present uses, the AO test has potential for other applications in SF selection and training: 1) as a selection screen that soldiers must pass before starting SF training; and 2) as an instructional feedback device to give prospective students a better idea of their prospects for success in Special Forces.

b5

Leader

Development

A
resource-constrained Army,
responsible for increas-
ingly diverse missions,
must be staffed by qualified,

competent,
and confident

leaders all levels. ARI research enhances personnel capabilities by defining future leader requirements, by developing new techniques to improve leader skills, and by developing new technologies for more effective selection, assignment, and development of battle commanders and their staffs for future mission requirements. Our research determines the key factors contributing to the effectiveness of tactical and operational unit commanders and their staffs and develops tools and techniques to improve battle command performance. We are also examining the implications of composite force structures in stability operations and are conducting longitudinal investigations of major Army human resource issues, to include careers, families, and retention. These efforts result in strategies, models, and tools for use by the Army leadership in shaping policies and programs that will define America's Army in the 21st century.

Leader Development

Battle Command Training Program Data Base

The Battle Command Training Program (BCTP) was established by the Army to improve command and control of combined arms forces. It applies computer technology as a tool to train war planning, war fighting, and decision making skills at division and corps levels.

The long term assessment of the BCTP will be based on how it provides feedback to improve unit performance and how it contributes to the Army's development of doctrine and battlefield operating procedures. The feedback will be based on the data generated by the BCTP Warfighter Exercises and the ARI developed database used to store Warfighter data. The BCTP database (BCTPdb) has the potential to provide a rich source of information for studying both short and long term Army higher-echelon command and control issues. Potential uses for this database include:

- ◆ Trace Changes in Division Training Practices. The performance areas to sustain and improve that are identified during the AARs and the discussion of lessons learned that characterizes the unit commander's AAR at the end of the exercise provide information that can be used to construct a well-formulated list of unit training objectives.

- ◆ Uncover Common Themes. Analyzing Warfighter data from several BCTP cycles can produce evidence pointing to systematic strengths and weaknesses in higher-echelon command and control doctrine and training.

It is the intention of the Center for Army Lessons Learned that the BCTPdb become the cornerstone of a CTC common database to be developed on an enterprise architecture plan which will provide for global access.

Practical Thinking Instruction

ARI created a successful program of instruction to hone the adaptive decision making skills of battle commanders. A TRADOC Commander asked ARI to develop a new way of teaching decision making. Since conventional decision making models were not keeping pace with the increasing demands of combat and non-combat situations, ARI departed with standard approaches and focused on the attitudes and cognitive skills required in adaptive decision making.

c2

The Practical Thinking instruction was developed from studying emerging models of "naturalistic" decision making, reviewing training programs in creativity and critical reasoning, and identifying key battle command skills. The instruction was incorporated as a pilot module in the Command and General Staff Officer Course (CGSOC). The students gave it positive marks and estimated a gain of 12.5 percent in their expertise across the lessons. CGSOC has since adopted the Practical Thinking lessons into a new core course.

Other government agencies have also seen merit in the ARI approach. Those interested in training adaptive decision making and the ARI approach include the Army War College, and federal, state and county law enforcement and fire fighting departments. The Practical Thinking instruction has the potential to make dramatic changes in how future Army leaders improve and the decision making models they use.



Battle Command at the NTC

***Products
Book***

ARI performs a wide range of research efforts to advance the battle command initiative. The goal is to assist the Army in continuing to develop leaders with the fundamental competencies and characteristics that enable them to see and understand the battlefield, establish a vision, articulate a unifying concept, and invoke the force to impose their will. One effort had the goals of identifying and explaining the "Art of Battle Command," and determining how battle command can be formally transmitted and taught within Army institutions. As part of this effort an investigation was made into the database of the ARI-Combat Training Center (CTC) Archive and Research Center, containing records of hundreds of simulated battles fought at the CTCs. The search used not only the record of battle events but also the notes and analyses of the observer-controllers (OCs) and the conclusions of the participants as revealed in the after action reviews. Identification of the critical leader behaviors supports clarification of battle command doctrine.

Visualization of the battlefield is more than the physical act of observing the battleground. It is a cognitive reconstruction of the battlefield framework that allows the commander to see enemy and friendly forces, terrain, and weather, in terms of time, space, and purpose. Examination of CTC take-home packages revealed two critical leader behaviors which, when deficient, impair the ability of the commander to see the battlefield. First, the commander must set and enforce standards for subordinate reporting and staff planning. Second, commanders must use and trust subordinates. They must listen openly and objectively judge the reliability and credibility of staff information. Thus, visualization of the battlefield relies not just on the tactical proficiency of the commanders but on their full range of skills including organizational and leadership competencies and the ability to train and discipline the unit. The commander must also provide focus to the staff and subordinate unit effort with clear, concise intent and guidance, and must ensure continued focus throughout the effort. Commanders must also focus their own attention on critical tasks that they can influence. They must avoid becoming so involved with one action that they allow other actions to remain unsupervised. The examination of the ARI-CTC Archive included case studies in which six missions were examined in great detail. These provided excellent illustrations of the critical leader behaviors discussed above, as well as additional leader requirements.

c3

Evaluating Knowledge-Based Systems

c4

A knowledge-based system (KBS) is a computer program that solves complex problems in a specific substantive domain. It differs from other software in that it solves problems that cannot be solved by individuals without domain-specific knowledge. One example of knowledge-based systems is those that incorporate artificial intelligence, such as expert systems.

The problem is that because of difficulties with evaluating software, and KBSs in particular, KBS developers and sponsors often do not have KBSs evaluated during development even though the impact on the quality of the system is much greater for evaluations conducted during development than after development.

ARI and the U.S. Army Artificial Intelligence Center (AAIC) have a joint project to identify, develop and document methods, procedures and measures for evaluating KBSs during and after development.

One of the products of this project is a book, *Handbook for Evaluating Knowledge-Based Systems: Conceptual Framework and Compendium of Methods*. The handbook is built around an evaluation framework to help evaluators decide what evaluation issues to address, when in the development life cycle each should be addressed, what evaluation methods to use at different points in the development cycle, and who should supply the evaluation data. The focus of the handbook is on user and subject matter expert evaluation of the usefulness of the system.

Another product of the project is a Generic Utility Questionnaire to obtain users' assessments of the system under evaluation. It can be quickly and easily tailored to evaluate different systems at different stages of development and contains ready made questionnaire items for a variety of dimensions the evaluator might want to users to assess.

Leadership Development at CLOR

**Products
Book**

The Center for Leadership and Organizations Research (CLOR) at West Point, New York, is a joint effort of ARI and USMA. The CLOR's research program includes the following areas:

♦ The Baseline Officer Longitudinal Data Set (BOLDS) to provide the Army with a longitudinal research capability on the leadership development of commissioned officers. It will describe individual leaders over time in terms of their personal characteristics, experience, and leadership. With continued updating, the BOLDS will provide a capability for understanding the emergence and development of leadership in officers over their entire careers, and will serve as a vehicle for developing and testing a comprehensive model of the leader development process.

♦ Archival Measures for Leadership Research to examine archival data in already existing data bases at USMA, and assess the potential for using existing data as (or for deriving) measures of (a) individual characteristics and external factors that may relate to leadership growth over time, and (b) leadership behavior and leadership effectiveness during precommissioning education and training. Measures found to have satisfactory levels of completeness, reliability, and validity will be included in the BOLDS for research purposes. (See also summary on "Analog Measures for Leadership Research.")

♦ Junior Leadership Development to investigate the leadership development of students at a state military college. Data were collected on their life experiences, personal characteristics, leadership performance, and leadership effectiveness in both academic and military settings.

♦ Viewing Leaders as Problem Solvers to propose an alternative model of leader development which characterizes leadership in terms of organizational problem solving, and identify cognitive abilities and temperament variables which are likely to be important to the progressive development of problem-solving capacity across levels of organizational leadership. This model has been tested on officers at each level of

c5

**Products
Book****c5**

Army schooling from Officer Basic Courses through Senior Service College. CLOR research added to the earlier test on officers in schools. These data are now being analyzed to determine relationships of the problem-solving capabilities of individual leaders to conditions in their units.

♦ Measuring Tacit Knowledge to understand the potential for learning from on-the-job experiences to maximize the benefits of the leader development opportunities afforded by operational assignments. Tacit knowledge is a type of knowledge that is procedural in nature, practically useful in attaining valued goals, and acquired on one's own without direct help from others. This concept holds considerable promise for maximizing the benefits of on-the-job experience. Three content-validated instruments for measuring tacit knowledge at three levels of leadership (platoon, company, and battalion) were developed based on items extracted from interviews with Army officers and validated with other officers. The items differentiated variations in experience levels or rated leadership effectiveness. The instruments describe military situations and elicit evaluative judgements of the quality of alternative actions in the situations described. Subject matter experts have examined the situation-action combinations for their military realism and aptness, and for the continued adherence to the properties of tacit knowledge: procedural, goal-oriented, and acquired on one's own. This project will culminate in recommendations for unit-based training to enable officers to acquire the types of knowledge previously considered to be tacit by their peers.

As work progresses on these five fronts, the CLOR will have created a comprehensive source of research data on leader development. Collectively, these separate projects should prove valuable in shaping education and training programs for organizational leadership into the next century.

Analog Measures for Leadership Research

***Products
Book***

ARI is testing the potential of developing, from organizational archives at the U.S. Military Academy, measures for use in research and study of broad organizational issues. In particular, archival data elements available across cohorts of individuals are being used to derive and test "analogs" of standard measures of behavioral factors. Analog composites having statistical reliability or validity are then being combined with other data for research on leader development. This archival approach has the advantages of: reducing the obtrusiveness of research on organizational operations; more effectively managing active participation time by organizational members; and obtaining lessons for structuring operational data files for their originally-intended use or for broader uses. This research has so far derived and assessed analogs for the scales composing the Assessment of Background and Life Experiences; future research will examine the personality constructs measured by the NEO Personality Inventory.

c6



Training

The objective of ARI's training systems science and technology program is to develop new training

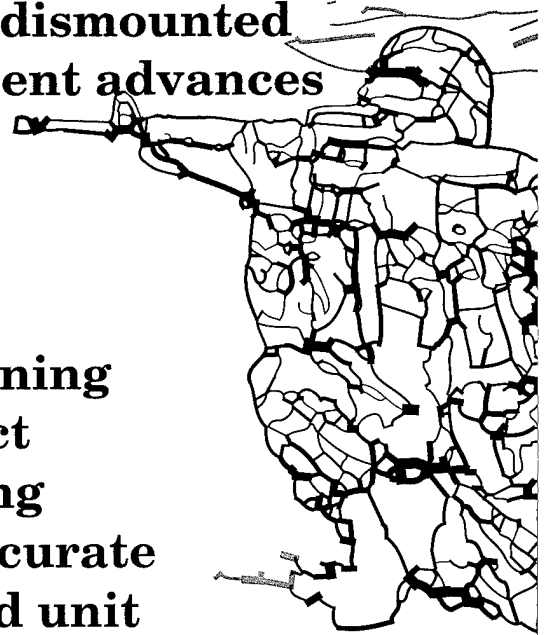
and performance measurement technologies that will allow the Army to effectively train the full range of individual and unit tasks within budgetary constraints. Much of the training systems research involves enhancing the effectiveness of new training simulation technologies such as distributed interactive simulation (DIS) through the development of training strategies.

This research has shown that the effectiveness of training aids, devices, simulators, and simulations (TADSS) is largely a function of their appropriateness to the tasks that they train, and the adequacy of performance measurement and feedback techniques. Virtual training simulations, no matter how elaborate or life like, are merely tools to be used to improve soldier and unit performance. ARI's research designs and evaluates new training methods and strategies that use

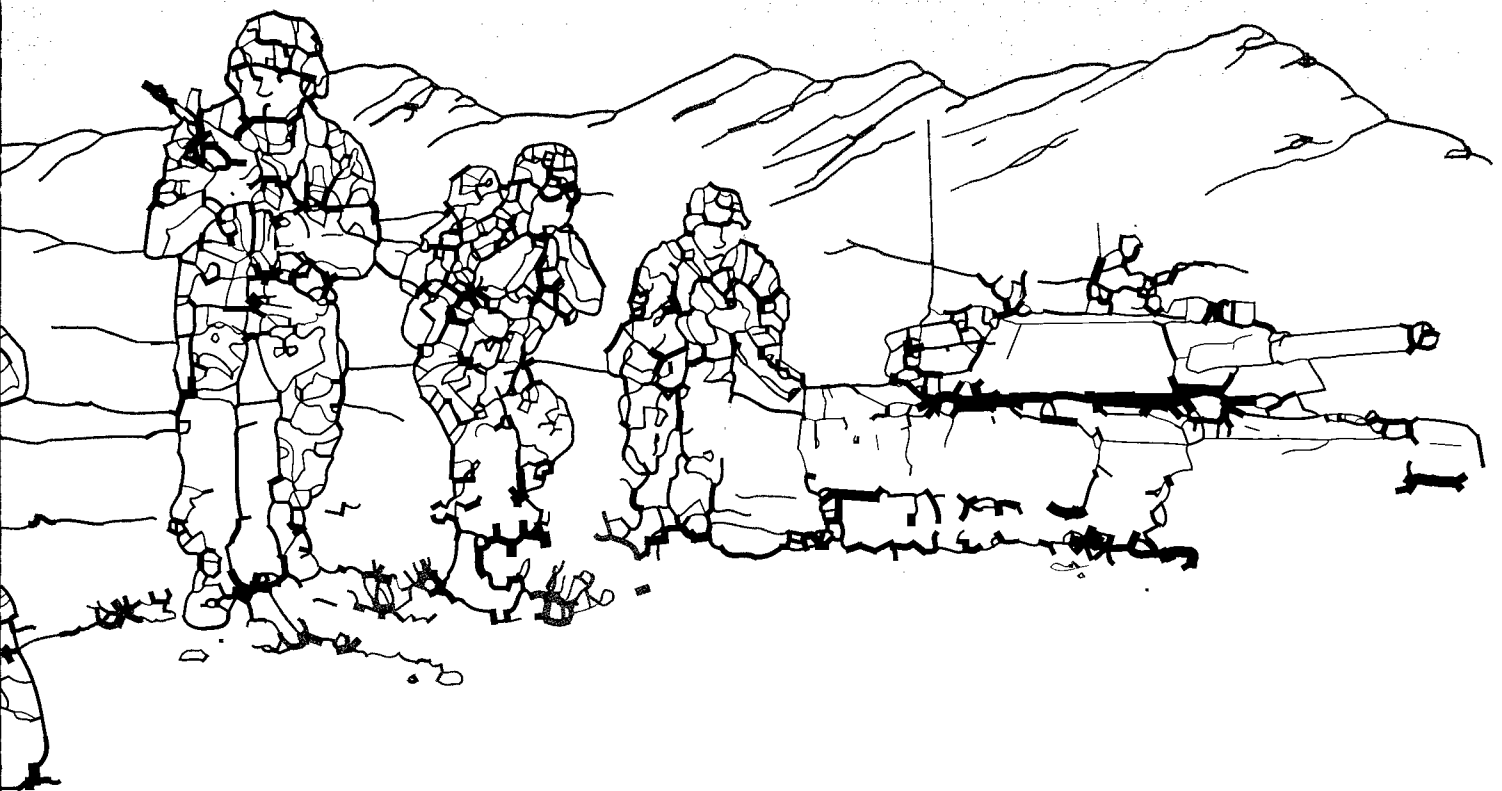
these new tools to improve training effectiveness and readiness.

ARI's Unit Collective Training program is designed to demonstrate a series of innovative unit training strategies based on empirical data that will permit commanders to build effective, within-budget, unit training programs. This includes the development and demonstration of training, mission rehearsal, performance measurement, and design feedback technologies that take full advantage of current and emerging DIS systems.

ARI's Land Warfare Training research is developing guidelines for the cost-effective mix of field training with TADSS for individual and small unit training with a focus on dismounted operations. Research builds on recent advances in modeling the retraining needs of soldiers by developing distance learning and other techniques to enhance skill reacquisition. Other research deals with immersion training techniques for low-intensity-conflict command and control tasks, training techniques for night operations, accurate behavioral models of individual and unit warfighting performance for use in synthetic environments, and methods for the effective use of intelligent tutors for acquiring and sustaining foreign language skills.



ARI's Rotary Wing Training research is designed to develop training technologies based on empirical data that support the development of lower cost aviation training and combined arms training for aviation. The research addresses training technologies that improve the cost-effectiveness of initial flight training and individual aviator and aircrew skills.



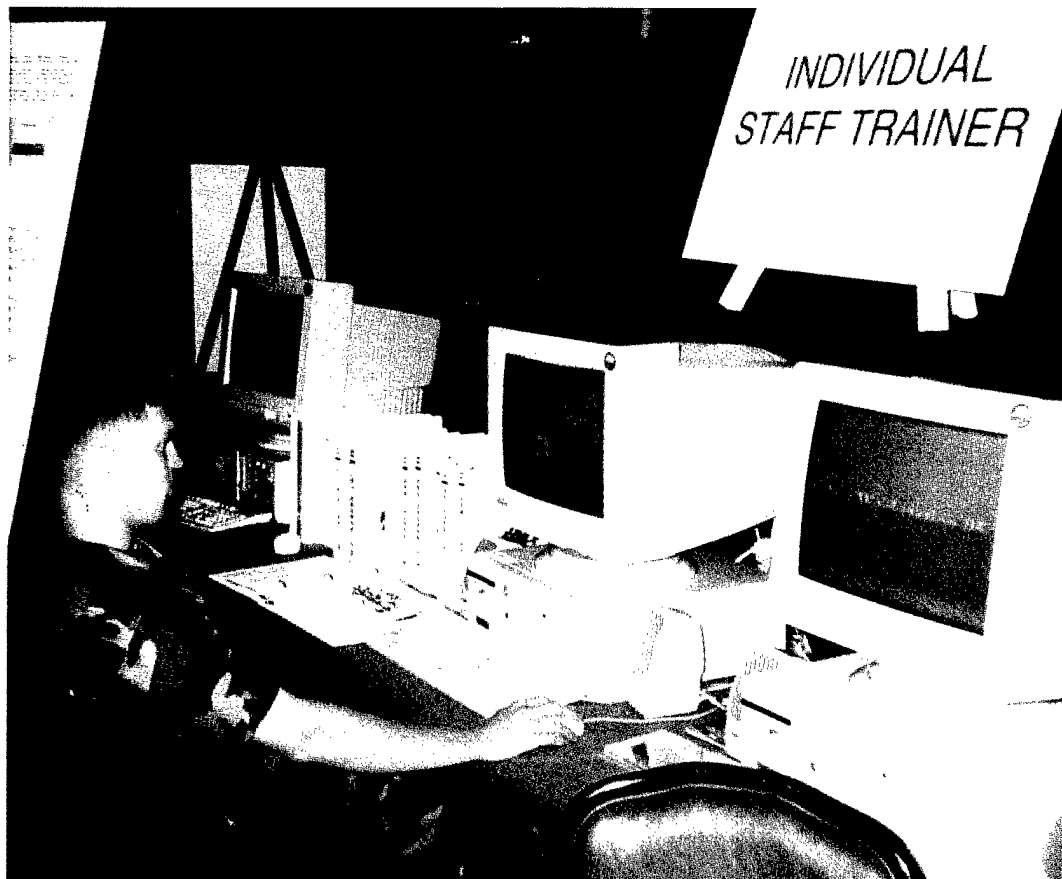
Battle Staff Training System

***Products
Book***

The Battle Staff Training System (BSTS) for maneuver staff training was designed to train individual staff skills through a multimedia approach using computer-based instruction complemented by text-based materials.

Thirteen doctrinally based staff training modules were developed for the National Guard for individual training at battalion level and thirteen at brigade level. A Common Core Course provides information used by all staff officers. Course modules provide core material necessary for the officer to function in the assigned staff position. Practical exercises simulate coordination with other staff sections. Diagnostic pretests, within-topic quizzes, and a final examination measure progress and provide feedback. The BSTS allows the staff officer to train at his own pace at home, in the unit, or at the armory.

d1



Reserve Component Virtual Training Program

The Reserve Component Virtual Training Program (RCVTP) has been established at Fort Knox, Kentucky. The intent of this program is to provide RC units with an intensive Combat Training Center-like training experience in virtual simulation during weekend drills.

d2

The RCVTP focuses on use of Simulation Networking (SIMNET) technology to train Army National Guard (ARNG) armor units. ARI has completed a research project to develop and demonstrate use of an innovative, highly flexible training program that capitalizes on SIMNET capabilities, while providing necessary preparatory training and performance feedback components.

Trials of the prototype training exercises with ARNG units received a highly positive response. The training program is currently in operation at Fort Knox, with RCVTP O/Cs providing training to ARNG units on a regular basis. Portions of the program have also been exported to support ARNG training at Gowen Field, Idaho. The final refined training program and documented methods for developing and implementing simulation-based training was available in December 1994. The program has also been used increasingly for training Active Component units, and it has thus been redesignated as the Virtual Training Program.

Building Training Strategies at Brigade and Above

***Products
Book***

The goal of this project is to enhance Army XXI training for echelons at or above brigade level. Its initial focus was on methods to (1) identify changing training requirements for brigades as a maneuver force, and (2) develop a plan for training and develop methods to assess success. To identify future brigade training requirements, ARI's scientists used an interview method they developed to query commanders about the phases of battle needing increased training emphasis. The most frequently cited needs were for combat reconnaissance, planning, and rehearsal. The next step was to develop a reliable method for unit commanders to use for designing training strategies. As a basis for these strategies, ARI developed a method to do detailed analyses of interactions among unit combat functions and their component tasks. ARI successfully tested the viability of this method for fire support -- its coordination, integration, and synchronization -- at brigade. Future work is planned to test the method at echelons above brigade and to develop better methods to assess such high-level collective training. This work supports training developers to design new or modify existing programs. It supports unit commanders to effectively plan, execute and assess training.

d3



ARI

Unit Collective Training

Products
Book

Critical Combat Functions (CCFs)

ARI's work on a battalion-level model training strategy and CCFs resulted in unique and valuable documentation which integrated a variety of training and doctrine sources. The products became known as the Functional Approach to Training. Several briefings were given at the Warfighter XXI and Army Training XXI Conferences to explain and promote the Functional Approach, and a meeting was held at TRADOC with training and doctrine developers to determine how the Functional Approach development methodology could be integrated into the Collective Training Development Doctrine. Efforts are ongoing at STRICOM to use the functional approach products in functional descriptions of the battlefield and detailed instructions for developers within the group of Combined Arms Tactical Trainers.

d4



Simulation-Based Mounted Brigade Training Program (SIMBART)

***Products
Book***

This project was initiated in August 1994 as a brigade-level expansion of the SIMUTA project. It is funded under the Army National Guard's Simulation in Training for Advanced Readiness (SIMITAR) program managed at the Advanced Research Projects Agency (ARPA). The objectives are to design, develop, formatively evaluate, and refine brigade staff exercises and complete training support packages for three missions on the NTC terrain database. These exercises are being developed for implementation on the distributed Janus system, developed by ARPA. The focus of SIMBART exercises is the primary staff members of a mounted brigade, including fire support and engineer officers. Initial exercise versions and training trials were completed during FY95.

d5



Simulation-Based Multiechelon Training Program for Armor Units -- Battalion Exercise Expansion (SIMUTA-B)

d6

This project is funded under the Army National Guard's Simulation in Training for Advanced Readiness (SIMITAR) program managed at the Advanced Research Projects Agency (ARPA). The primary objectives are:

- ◆ to develop a battalion exercise and complete training support package (TSP) for the Deliberate Attack (DATK) mission on the National Training Center terrain database.
- ◆ to upgrade the original SIMUTA battalion-level exercises and TSPs, based on lessons learned during DATK exercises and TSP development.

The SIMUTA-B project was expanded in September 1995 with additional SIMITAR funding; this expansion is called SIMUTA-B+. The objectives of this effort are to develop a version of the Janus DATK exercise that includes engineer support, and to develop platoon and company DATK exercises in SIMNET. The battalion-level DATK exercises and TSPs were completed in SIMNET and Janus versions in September 1995.

A First Generation "Smart" AAR System

Products
Book

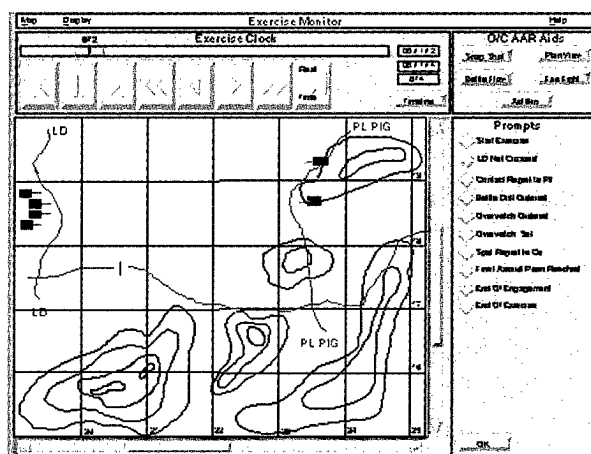
Effective application of the after action review (AAR) process requires many complex decisions on the part of AAR leaders. Two critical components of the AAR process are (1) the use of displays to examine unit performance and (2) asking questions that help the unit to diagnose deficiencies and identify potential corrective actions.

ARI's initial support for AARs in the simulation networking (SIMNET) environment centered around the development of the Unit Performance Assessment System (UPAS) to provide displays illustrating unit strengths and weaknesses. ARI made substantial progress in identifying data displays that could be used to analyze what happened during an exercise. But we discovered problems in applying the personal computer-based UPAS to AARs. These problems in supporting AARs were addressed successfully in the development of the Automated Training Analysis and Feedback System (ATAFS). In December of 1994, ATAFS demonstrated the capability to automatically generate AAR aids and to move back in exercise history using an AMIGA workstation platform. The animated data displays included the synchronized replay of radio communications data.

The next phase of research called for moving the ATAFS to a Silicon Graphics Indy platform with UNIX multi-tasking, developing computer-based training (CBT) for ATAFS users, and testing the ATAFS at six ARNG sites. In Fall 1995 ATAFS systems were installed and user training conducted at three of the ARNG sites, including the Virtual Training Program (VTP) at Fort Knox.

The ATAFS has utility as a training research tool in addition to serving as a training tool. In its current form it can be employed to examine the effects of doctrinal, organizational, training, materiel, and leadership interventions on unit performance. The modular nature of the ATAFS also enables it to serve as a starting point for examining AAR display requirements for higher echelons and for applying a knowledge database to exercise data streams other than SIMNET. These data stream options include the distributed interactive simulation protocols to be used by the Close Combat Tactical Trainer, the data streams generated by instrumented ranges such as the National Training Center, and data generated by constructive simulations like the Corps Battle Simulation.

d7



Close Air Support Training Across the Services

In cooperation with other Service R&D organizations, ARI developed the Multi-Service Distributed Training Testbed (MDT2) to support training R&D across the Services. MDT2 determined methods for planning and conducting training with Distributed Interactive Simulation (DIS) technology. DIS technology, which grew from the SIMulator NETworking (SIMNET) project, provided a promising way to link different simulators at separate locations. ARI took the lead in determining practical and effective ways to apply DIS technology.

The application of DIS to training across the Services was new except for a few engineering feasibility demonstrations. MDT2 used DIS over a five-day period for successful training that focused on Close Air Support (CAS) where aircraft support ground forces. This was the first time in a training environment that multi-Service CAS was planned, integrated-synchronized, and executed. In addition, it was the first time that data were collected to document such training.

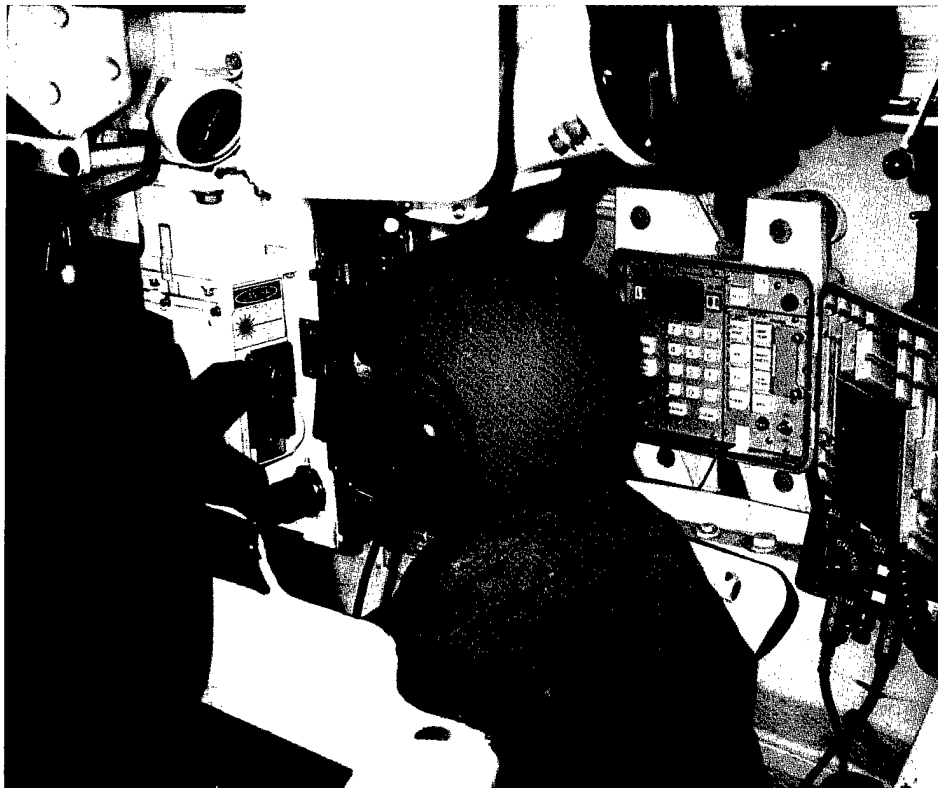
MDT2 documented the training with data about performance of CAS procedures, resulting battle outcomes, and the testbed's fidelity for such training. It achieved two important milestones in its initial phase: (1) development of training objectives and scenarios to support DIS-CAS training, and (2) design of special methods to conduct training feedback using DIS technology. In the follow-on phase, MDT2 tested and verified the methods for planning, conducting, and assessing multi-Service CAS training. Results are summarized in briefings, in two MDT2 videotapes, in symposia proceedings, and in an inter-service report describing recommendations for how to plan and conduct such tactical training.

Research Pays Off for the Guard: A Device-Based Strategy for Training Tank Gunnery

***Products
Book***

An ARI-developed device-based strategy shows Army National Guard armor unit trainers how to complete the device-based portion of their tank gunnery training in just three drill weekends, and afterwards be able to predict the percentage of first-run qualifying crews on Tank Table VIII. The strategy also eliminates guesswork in determining which crews should be trained, which devices should be used, which training and evaluation exercises should be conducted, and which device-based performance standards should be applied to maximize the payoff from the training time invested on devices.

d9



ARI

Unit Collective Training

Products
Book

d10

Training in a Digitized Battalion Task Force

Effective soldier and unit training with emerging digital technologies is essential to the successful accomplishment of Advanced Warfighting Experiments (AWEs) and Force XXI objectives. An ARI research effort in conjunction with the Mounted Battlespace Battle Lab's Focused Dispatch AWE documented the battalion task force digital training efforts, extracted training lessons learned, and identified implications for future Force XXI training efforts. Lessons learned and implications were specifically identified in nine key areas that will impact future Force XXI training: training strategy, training management, training methods, prerequisite skills and knowledge, digital learning centers, simulation training, training literature, training assessment, and training support.



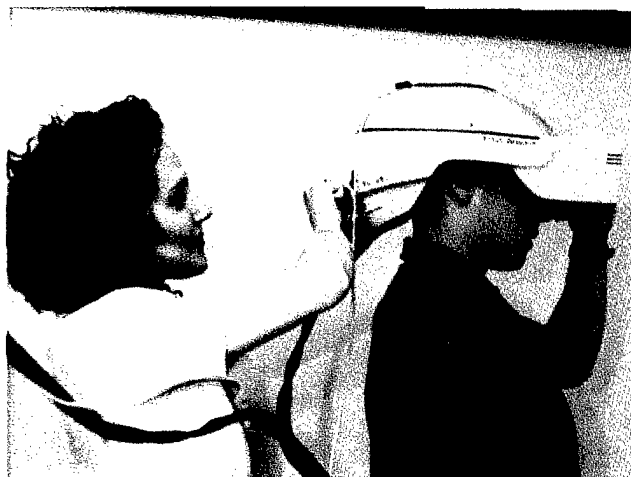
Virtual Environments for Combat Training and Mission Rehearsal

***Products
Book***

In order to integrate the dismounted soldier into the distributed interactive simulation (DIS) simulated battlefield through the use of virtual environment (VE) technology, a Virtual Environment Research Laboratory was established by a contract between ARI and the University of Central Florida Institute for Simulation and Training (IST). Virtual Environment Performance Assessment Battery (VEPAB) tasks were developed to represent the kinds of activities required of dismounted soldiers. The first VEPAB experiment examined the sensitivity of task performance to different control devices. Subsequent experiments dealt with issues of display devices, training effectiveness factors for VE, use of VE for land navigation and route planning, and distance estimation in VE.

e1

A current research effort concerns the use of VE technology to train small dismounted unit leaders and teams to develop and maintain situational awareness. VE can provide a compelling sense of actually being in a simulated environment, and can provide sufficient realism to train routes through complex buildings and the identification of specific terrain features. But its current limitations preclude its use for dismounted unit ARTEPs or drills. Based on this assessment, we planned the initial phases of an experimental program using synthetic tasks to investigate the effects of training strategies, instructional features, and interface characteristics on situational awareness skills, with a reduced demand for a high fidelity interface. We also developed a simulated environment and simplified trainee interfaces, and data collection is underway.

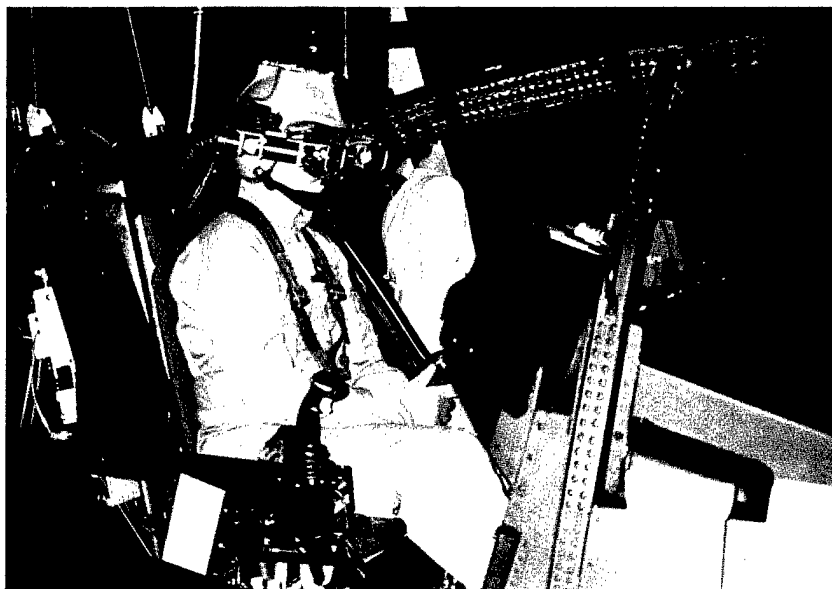


On-the-Job Training

e2

Future reductions in training resources within TRADOC will have the effect of increasing the number of critical skills that will be trained in the field through on-the-job training (OJT). The Comprehensive Program to Deliver OJT targeted Army National Guard tank units as the research site for studying how tank crews are trained by OJT providers, and as a testbed for developing and testing a prototype training program for OJT providers, aimed at improving their OJT skills. OJT providers were generally found to lack adequate OJT instructional skills and strategies. A model of OJT was developed and validated, and is consistent with findings in related literatures, such as tutoring, coaching, mentoring and training. The key behaviors of the OJT provider characterized by the model are: adjusting training climate, assessing progress, tailoring instruction, injecting expertise, clarifying goals, and promoting ownership. An OJT provider training package was delivered in late Spring of 1995, containing useful, effective, practical, and economical sets of prototype OJT training materials. These training materials were shown to increase the skills of OJT providers in both the National Guard and commercial settings.

Not only do these materials offer savings in training cost, but they can ensure that training is more relevant to the trainees' jobs and of higher quality than before. Training sessions in the active Army are in the planning stage now, with heavy input from military users to ensure relevance and practicality.



Unaided Night Vision Instructional Program for Ground Forces

***Products
Book***

The unaided night vision instructional program was developed to remove deficiencies in current ground force doctrine and training literature, training materials, and courses. Program development was a joint effort between the Naval Aerospace Medical Research Laboratory and ARI, with ARI as the lead agency. All training effectiveness research was conducted by ARI.

e3

The program provides basic information and demonstrations on how the eye works at night. The program was evaluated with both civilian and military instructors using three populations of experienced soldiers. Those who had the program outperformed those who did not have the program on a test of knowledge, resulting in a 40% increase in scores regardless of time served in the Army. Program effects with Infantry trainees were similar to those with experienced soldiers. In addition, retention of the material was high.

The program has been distributed to selected units for their use: the Ranger Training Brigade, the opposing force at the Joint Readiness Training Center, and the 82d Airborne. It is being used by the Dis-mounted Battlespace Battle Lab in their Night Fighting Training Facility and in their distributed training program

ARI***Land Warfare Training******Products
Book***

Shooting with Aiming Lights and Night Vision Goggles

ARI has developed and tested both live-fire and dry-fire procedures, which resolved problems with zeroing aiming lights. Both procedures are inexpensive and can be implemented with materials readily available to a unit, without the need to procure special boresighting equipment.

e4

Also, both procedures save ammunition. The zero procedures are in the 82nd Airborne Division's Small-Unit Night Fighter Manual and have been used by the Dismounted Battle Space Battle Lab. Follow-on experimentation with alternative dry-fire techniques by the Battle Lab incorporates the fundamental concepts in the ARI work.

Training Requirements for Stability Operations

***Products
Book***

ARI's research program on improving training for stability operations focused on ambiguities associated with stability operations and the concomitant varying conditions and rules of engagement.

Several earlier research efforts helped provide a front-end analysis and overall guidance on where training research contributions are needed.

Research on home station determinants of effective unit training provided information on the lack of synchronization within battalion staffs. This overall finding led to issues related to difficulties faced by maneuver battalions in integration of, and understanding the requirements and capabilities of, Civil Affairs (CA) and Psychological Operations (PSYOP) personnel on their staffs. Analysis has also identified problems with the traditional methods of performance measurement at the Joint Readiness Training Center (JRTC).

Another research project focused on a Multinational Force and Observers (MFO) Sinai battalion on a peacekeeping mission. The primary challenge in pre-deployment training for this unit was determining the best balance between honing skills for traditional infantry missions and in teaching the peacekeeping-specific skills of reporting and checkpoint operations.

Ongoing research addresses some of the issues of continuous operations, and the effects of sleep loss on soldier performance. In future efforts, ARI will apply technology to enhance training environments using distributed interactive simulations (DIS) and computer-based instruction.

e5

Learning Language for Jobs: The Military Language Tutor

e6

The Military Language Tutor (MILT) is a product of the Advanced Technologies for Language Learning Program at ARI. MILT is designed to train and sustain the foreign language skills needed in Army linguist jobs. MILT was designed to help Army linguists maintain perishable, dialogue-based foreign language skills after they graduate from initial training at the Defense Language Institute. The key capabilities of MILT are that

- ◆ students can use language in job scenarios and dialogues by employing natural language processing;
- ◆ the software adapts to students — errors of syntax and usage in student's productions are automatically captured and evaluated by

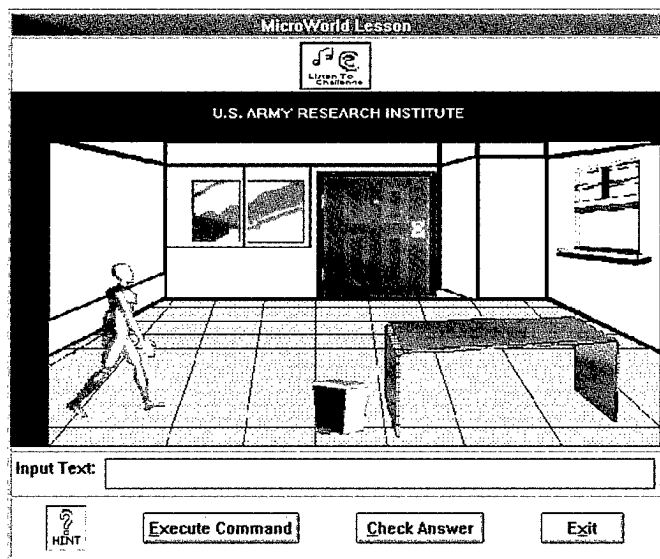
natural language processing (NLP) and can be fed back immediately to the student; and

- ◆ instructors can make new lessons with an easy-to-use authoring front end.

The first generation MILT delivers interrogator-specific lessons for the U.S. Army Intelligence Center and School. The system is being beta tested with Army interrogators and will then be delivered to the School. A systematic evaluation is ongoing to discover the best configurations of exercises and feedback to promote skill retention in Army interrogators. MILT will become part of the

Army's training software inventory through TRADOC.

A cooperative research and development agreement (CRDA) has been signed between ARI and the MILT developer, Microanalysis and Design, of Boulder, Colorado. The CRDA provides for converting MILT into a commercial product and marketing it to language learning communities ranging from schools and universities to business and industry.



ARI Products Book -- Correction

The two pages for item e7

(Skill Decay and Reacquisition)

were reversed in printing.

The second printed page is

the first page of the summary.

Products Book

e7

Policy implications: A change to the former mobilization policy of calling up first only those IRR members separated 12 months or less is currently being implemented. The proposed expansion of the window to 24 months is compatible with ARI's research on retention and relearning, at least for the procedural skills studied to date. One suggestion flowing from ARI's work is that hands-on instruction be used whenever possible within rapid train-ups. Another recommendation is the utilization of personnel data to engineer a selective call-up, concentrating on soldiers who have at least one full tour of prior active duty service, average or higher general aptitude, and current civilian occupations similar to their military specialties. Similarly, those identified as unlikely to have retained their skills well while in the IRR (and as unlikely to gain much from a rapid train-up) could be considered candidates for cross-training to a shortage MOS. ARI is currently developing a model that combines these considerations.



TRAINER'S GUIDE FOR REFRESHER TRAINING -- OPERATION JOINT ENDEAVOR --

The following task factors should be considered when establishing priorities for refresher training:

About This Guide

Purpose: General guidance for scheduling refresher training.

Intended Users: Trainers of the stability operations tasks required for soldiers deploying to Bosnia or Hungary.

Origin: *Instructors at 7th ATC, Hohenfels, provided judgments on characteristics of tasks taught there.*

Using methods developed from earlier research, the U.S. Army Research Institute converted these expert judgments into predictions of task retention.

1. CRITICALITY:

Decide how critical each task is to your particular unit's mission -- give priority to the most critical tasks.

2. RECENCY:

Determine how long it has been since your unit has performed each task -- give priority to tasks not done recently.

3. PREDICTED RETENTION:

Locate the tasks you expect to train within the ranking on the reverse side of this sheet -- give priority to tasks with high ranks (#1 is 'highest').

March 1996

Skill Decay and Reacquisition

***Products
Book***

In 1990-91, ARI followed samples of Individual Ready Reserve (IRR) soldiers in five military occupational specialties (MOSs) mobilized for Operation Desert Shield/Desert Storm. Tests given to these soldiers prior to any training showed the expected patterns of skill decay (e.g., steepest decline in job knowledge during the first few months after separation, less loss for physical skills). The best single predictor of performance was found to be a soldier's level of previous learning, as measured by recorded scores on skill qualification tests. Length of active duty and general aptitude (but not time out of service) were found to have significant effects, especially on retention. As a follow-up, the Assistant Deputy Chief of Staff for Personnel tasked ARI to develop a continuing program of study on these topics, with an emphasis on skill reacquisition, i.e., the relearning of rusty MOS skills.

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The first study in that program, CALL FORWARD 93, found that rapid train-up instruction carried out both by classroom lecture and by hands-on demonstration and practice significantly improved performance. And, soldiers' scores both before and after training were strongly related to the length of their prior active duty service and to their AFQT scores. Importantly, the time since a soldier left active duty did not significantly affect the soldier's performance.

In a second study, a purely classroom-lecture format of instruction was used. Although the same pattern of advantage was found for those with prior active duty service and high AFQT scores, the success of the instruction was found to be limited. The only improvement found in test performance from before-instruction to after-instruction was on explicitly trained information. The lack of a generalized improvement appears attributable to the lack of hands-on training.

Analysis is currently under way on the results of CALL FORWARD 95. Preliminary results support the earlier findings of significant active duty time and aptitude effects upon performance, but no effect for the "time since separation from active duty" variable. It does not seem to matter much how long soldiers are required to remember their skills and job knowledge, at least within the range of 6 to 36 months. Another influence upon retention is the degree of similarity between an IRR soldier's civilian occupation and that soldier's MOS.

TH-67 Training Transfer

***Products
Book***

ARI has designed and conducted an experiment evaluating the training effectiveness of a low-cost flight simulator representing the Army's TH-67 training helicopter. To date, some preliminary data analyses have been completed.

The training issue under investigation in this research is whether training in a low cost simulator will improve student pilot performance in the aircraft. The research issue is whether there is significant positive transfer of training from simulator to aircraft.

ARI has been conducting research on low-cost simulators for a number of years. The general conclusion drawn from the results of these experiments was that low-cost simulation has considerable potential for reducing the cost of primary phase flight training.

The present experiment using the TH-67 Flight Simulator yielded results indicating that pretraining in the low-cost simulator saved training time in the aircraft. It appears that time to the criterion (i.e., successful completion of an evaluation checkride) was a sensitive measure of training effectiveness. The data also suggest that pretraining in the simulator reduced performance variability.

Another indicator of IERW performance is the total number of accumulated flight hours at the end of the unsupervised solo. Mean total hours at the end of the unsupervised solo were significantly fewer for the experimental group. There was also lower variability which could be indicative of more uniformity in performance among those student pilots who were pretrained in the simulator.

This experiment is the first in a series of investigations into the feasibility of using low-cost simulation in the IERW training environment. In the present experiment, student pilots used the simulator as an adjunct to the traditional IERW training syllabus; nothing else was changed. In future experiments, the use of simulation will be evaluated as an integral part of the total IERW training system. For example, some of the issues that ARI plans to investigate are the use of simulation to integrate and enhance those skills already learned in the aircraft, and the degree to which practice in the simulator can substitute for practice in the aircraft.

Effects of Wearing Aviation Life Support Equipment (ALSE)

f2

ARI investigated the effects of wearing nuclear, biological and chemical (NBC) survival ensembles on crew performance and flight parameters. Initial research with individual pilots using the Simulator Training Advanced Testbed for Aviation (STRATA) AH-64A pilot crew station found some degree of performance degradation. The next experiment, with Apache crews, involved the conduct of missions in a simulated tactical environment, and also used the STRATA simulator. We found that the current set of NBC gear led to substantial difficulty in performing many of the critical tasks required of Apache aircrews. This included impacts of increased workload, physical pain, performance accuracy, and perceptual and motor ability.

The STRATA Air Warrior baseline simulation results and experience provide a solid foundation for conducting future simulations to evaluate the performance effects of improved Air Warrior systems and components. The simulation methodology, missions, maneuvers, tasks, measures, and analyses appear to be effective for evaluating the performance effects of Air Warrior development products. The results and experience from conducting these baseline simulations allow future simulations to be conducted efficiently and tailored to focus on specific issues when required.



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